

margins of vertebra of fishes but not in the family of mollusks, *Luncidæ*.

The specimen is preserved in a portion of a small concretion, very similar in many respects to concretions found near the mouth of the Columbia River as at Knapton, Washington and Astoria, Oregon.

It seems altogether probable that a mistaken locality label may have led Hannibal to make his original determination and the name *Zalophancylus* should be transferred to the Class Pisces. The locality given with the description was Pliocene lake beds in the Badland Hills one mile east of Sand Hollow, eastern Oregon.

PARTULA IN GUAM¹

BY T. D. A. COCKERELL

After an extensive study of *Partula* in the Society Islands, where the genus is most abundantly represented, Dr. Crampton thought it well to examine the Mariana Islands, over 4000 miles distant, at the extreme northwestern end of the range of these snails. He found there only four species, one of them new, but the observations made amply justified the expedition. The results are set forth with the minuteness of detail, lucidity of exposition, and abundance of beautiful figures which we have come to expect in Dr. Crampton's reports. The one new species discovered, *P. salifana*, was found only in a single locality on Mount Salifan in Guam. It is very distinct, and in several respects approaches the Society Island type of *Partula* rather than the section hitherto known from Guam. It seems likely that it is not a recently evolved species, developed from the *Partula* population of the surrounding country; but rather an old form, probably once much more widespread, and now limited to a small region, where it is nearly extinct. Merrill (1914) ex-

¹ H. E. Crampton. Studies on the Variation, Distribution and Evolution of the Genus *Partula*. The species of the Mariana Islands, Guam and Saipan. Carnegie Institution, 1925. Pp. 116, 14 plates.

pressed the opinion that prior to the advent of man, Guam was undoubtedly covered by a continuous forest. Crampton shows that there now exist large open areas, quite unsuited to *Partula*, and there can be no doubt that the snails have been exterminated in many places where they once existed. The question is discussed, whether the Mariana Islands represent the peaks of a much larger, submerged, area, or have developed by uplift from the ocean bed. The geological evidence appears to support the latter view, but Crampton regards the biological facts as favoring subsidence. He points out that as a matter of fact, these snails do not appear to be transported from island to island, even when the islands are not very far apart. His observations do not favor the hypothesis of oversea transport, although he recognizes that *Partula hyalina* is found in Tahiti as well as in the Cook and Austral groups. Merrill, commenting on the poor flora of Guam (225 indigenous species, 27 per cent endemic), remarks that Guam is undoubtedly recent from a geological standpoint, and sees in this supposed fact an explanation of the condition of the flora. There is not a single endemic genus of plants, though one genus is only known from Guam and Yap. I venture to think that Merrill does not make sufficient allowance for the extermination of the flora since man's arrival. It can hardly be doubted that what we now see is but a fragment of what once existed, and my own observation (e. g. in the Madeira Islands) is that the plants of insular areas disappear with human occupation much more quickly than the snails. Introduced woody plants compete with the native ones even in the forests, but the snails survive so long as they have cover, and are less dependent on precise types of environment than the insects. In my study of bees from the islands of the Pacific, I have found that those of Guam closely resemble in type those of Samoa and other parts of Polynesia, but all these differ strongly from the bee fauna of the Hawaiian Islands. Considering the ocean depths to the south and east of Guam, it appears almost inconceivable that there was ever a land connection with the groups of islands south of the equator, which are now occupied by *Partula*. But the whole fauna of the islands from Guam to Tahiti certainly shows a singular

congruity, indicating past migrations over the area. The time involved is probably very great, and it does not seem necessary to postulate continuity of land at any particular period from one end of the Polynesian group to the other.¹

In dealing with the color-variations, Crampton proposes special names, "not of taxonomic significance." Hence he gives the name *strigata* to a particular form of *P. radiolata*, although it was earlier named *rushii* by Pilsbry. The names of the color types are similar to those employed elsewhere, especially in Europe, for what are called varieties. It does not appear possible to regard them as outside taxonomy, and there is no warrant, under the present rules, for disregarding priority. At the same time, it might be possible and desirable to eventually establish a sort of code of names for such variations, requiring the same designation to be employed for parallel variations of different species. Even so, the names should be formally proposed and type specimens preserved, or uncertainty will result.

REVERSED LYMNAEA PEREGRINA²

BY T. D. A. COCKERELL

Jules Verne, who knew well how to dramatize natural history, was well aware of the wonder and interest excited by reversed coiling in shells. In his *Twenty Thousand Leagues*

¹ Dr. P. Marshall, in his address before the Australasian Association for the Advancement of Science, published in 1912, concludes that bathymetrical, structural and petrographical characteristics support the idea that the real boundary of the southwest Pacific passes through New Zealand, Kermadec, Tonga, Fiji, New Hebrides, Solomons, and on to the Admiralty Islands. He thinks that the land connection or approximation took place in the late Mesozoic or in the Pleistocene, probably both. The eastern Pacific islands are different in structure, nature and origin, and have derived their fauna and flora by chance migrants from the region just indicated. The headquarters of *Partula* are then in a permanently oceanic group.

²The Inheritance of Inverse Symmetry in *Limnaea peregrina*. By Cyril Diver, assisted by A. E. Boycott and Sylvia Garstang. *Journal of Genetics*. March, 1925. Vol. 15, pp. 115-200.